A Longitudinal Examination of the Role of Self-Control in the Relation between Corporal Punishment Exposure and Adolescent Aggression

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Abstract: Prior research has demonstrated the importance of low self-control and corporal punishment exposure as risk factors for the development of aggressive behaviors. However, much less is known about the interplay between these two factors, that is, the extent to which they each contribute uniquely to aggression and/or interact synergistically to create a profile of particularly severe risk. Similarly, high self-control may be a moderating protective factor that helps explain why only a subset of individuals exposed to corporal punishment develop high levels of aggression. Data from the longitudinal Zurich Project on the Social Development from Childhood to Adulthood (z-proso) were used to address this question. Students completed self-report surveys at three time points; ages 11 (n = 1144; 51% males, 49% females), age 13 (n = 1366; 51% males, 49% females) and age 15 (n = 1447, 52% males and 48% females). An autoregressive cross-lagged panel model was used to examine self-control as a protective factor with both a direct effect and as a moderator of the links between corporal punishment and adolescent aggression across time. The results indicated that self-control was a protective factor against concurrent aggression. However, when considering the longitudinal effects, the protective capabilities of self-control differed depending on the stage of adolescence, gender and levels of exposure to risk. There was no consistent moderating effect of self-control. However, findings suggest that interventions that address low self-control are likely to be beneficial due to their direct effects on aggression, rather than by weakening the effects of exposure to harsh punishment.

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Abstract

Prior research has demonstrated the importance of low self-control and corporal punishment exposure as risk factors for the development of aggressive behaviors. However, much less is known about the interplay between these two factors, that is, the extent to which they each contribute uniquely to aggression and/or interact synergistically to create a profile of particularly severe risk. Similarly, high self-control may be a moderating protective factor that helps explain why only a subset of individuals exposed to corporal punishment develop high levels of aggression. Data from the longitudinal *Zurich Project on the Social Development from Childhood to Adulthood* (z-proso) were used to address this question. Students completed self-report surveys at three time points; ages 11 (n=1144; 51% males, 49% females), age 13 (n=1366; 51% males, 49% females) and age 15 (n=1447, 52% males and 48% females). An autoregressive cross-lagged panel model was used to examine self-control as a protective factor with both a direct effect and as a moderator of the links between corporal punishment and adolescent aggression across time. The results indicated that self-control was a protective factor against concurrent aggression. However, when considering the longitudinal effects, the protective capabilities of self-control differed depending on the stage of adolescence, gender and levels of exposure to risk. There was no consistent moderating effect of self-control. However, findings suggest that interventions that address low self-control are likely to be beneficial due to their direct effects on aggression, rather than by weakening the effects of exposure to harsh punishment.

Key words: Protective factors; self-control; corporal punishment; adolescent aggression; longitudinal design.

Introduction

Research on corporal punishment has traditionally focused on the development of aggression and how this predicts future criminality (Gershoff, 2002). Several longitudinal studies have now linked corporal punishment with an increase in subsequent aggression (Lansford, Wager, Bates, Pettit, & Dodge, 2012). Corporal punishment is thought to increase antisocial behavior because it models aggression (Bandura, 1977; Bandura, 1978), interferes with internal attributions for acceptable behavior, and does not teach children why their behavior was wrong or what alternative behaviors are appropriate (Gershoff, 2013). However, not everyone who experiences corporal punishment becomes aggressive. Understanding the mechanisms that differentiate those who are exposed to corporal punishment who do, versus do not, go on to develop aggression may have implications for prevention. Highlighting these mechanisms may provide insights into the leverageable individual and/or environmental factors that can be targeted to help children develop well, despite exposure to corporal punishment. Doing so is important because, despite an increasing global trend towards outlawing corporal punishment, many countries still permit corporal punishment. Further, even where bans are in place and/or where parental attitudes to corporal punishment are unfavorable, many parents still practice corporal punishment out of desperation or a lack of alternative tools for managing their child's behavior (Taylor, Hamvas, Rice, Newman, & DeJong, 2011). Thus, this study examines the direct and interactive protective effects of self-control assessed at age 10 to age 15 between corporal punishment and aggression concurrently. Furthermore, it addresses a gap in the literature by examining self-control as a protective factor from early to mid-adolescence.

Definition of Protective Factors

There are various types of protective factors, including direct protective factors, risk-based protective factors, and interactive/buffering protective factors. A direct protective factor is defined as a factor that predicts a low probability of offending (Ttofi, Farrington, Piquero, & DeLisi, 2016). A direct protective factor refers to the main effect of a variable and predicts a low probability of future problem behavior without taking other factors into account (Lösel & Farrington, 2012). A risk-based protective factor is defined as a factor that predicts a low probability of offending among a risk category (Ttofi, Farrington, Piquero, & DeLisi, 2016). An interactive protective factor (also known as a buffering protective factor) is defined as a factor that predicts a low probability of problem behavior among a group of individuals exposed to a specific risk factor (Ttofi, Farrington, Piquero, & DeLisi, 2016). An interactive protective factor is one that moderates or attenuates the impact of a specific risk (Lösel & Farrington, 2012). Furthermore, an interactive protective factor differs from a risk-based protective factor as a risk-based protective factor refers to a variable that predicts a low probability of offending amongst a defined group at risk, rather than focusing on the interaction with a specific risk factor (Jolliffe, Farrington, Loeber & Pardini, 2016). It has been argued that an interactive protective factor is present when there is no increase in the probability of offending in the presence of the risk factor; however, when the protective factor is absent, the probability of offending does increase in the presence of the risk factor (Ttofi, Farrington, Piquero, Lösel, et al., 2016). For the purpose of the current study, the term interactive protective factor will be used to refer to a variable that acts as a moderator and attenuates the risk of aggression when coupled with the risk factor, corporal punishment.

Self-Control as a Protective Factor

Corporal punishment is commonly defined as the use of physical force with the intention of causing a child to experience pain, but not injury, for the purposes of correction or control of the child's behavior (Straus & Donnely, 2001). The most commonly used forms of corporal punishment are spanking, slapping, shoving a child roughly, and hitting with certain objects (i.e. belt). The definition of corporal punishment and physical abuse differ in that the former does not intend to injure, whereas the latter does (Al-Modallal, Peden, & Anderson, 2008). Research has found that corporal punishment can lead to increased adolescent aggression because it models aggression (Gershoff, 2002), promotes hostile attributions, leads to poor emotional regulation, negative social information processing (Weiss, Dodge, Bates, & Pettit, 1992) and can increase reciprocal instances of aggression between the child and the parent (Gershoff, 2002). However, as discussed, not everyone who experiences corporal punishment develops adolescent aggression. Thus, it is important to identify which factors may protect an individual from developing subsequent aggression.

One candidate protective factor is self-control. Self-control is the capacity to override or alter unwanted behavioral responses and refrain from acting on them (Tangney, Baumeister & Boone, 2004). The relation between self-control and delinquent behavior is explained by Gottfredson and Hirschi's (1990) General Theory of Crime. They argue that the causes of crime and deviance relate to an individual's level of self-control. More specifically, the higher the level of self-control that an individual has, the less likely they are to partake in criminal and deviant acts. This is because higher levels of self-control or self-regulation increase an individual's ability to delay gratification, control emotions and regulate their behavior (Barnes, Boutwell, Beaver, & Gibson, 2013). Previous research has found that individual levels of self-control emerge during the first years of life (Barnes, Boutwell, Beaver, & Gibson, 2013) and differences between individuals remain relatively stable over the life span. Gottfredson and Hirschi (1990) also argue that self-control develops early in childhood. It has been argued that parents aid children in developing self-control by monitoring the child's behavior, recognizing undesirable behavior and administering appropriate discipline when required. Self-control is therefore developed by the parents exercising social control (Gottfredson & Hirschi, 1990).

Those with low levels of self-control may have an exacerbated risk of aggression when exposed to corporal punishment, thus it is possible to speculate on several ways in which high self-control could reduce the effects of corporal punishment on adolescent aggression. For example, high self-control may help an individual to resist the use of aggression in response to frustration, despite their parents having modelled this behavior. No study has yet examined this possibility; however, several have provided evidence consistent with the idea. Various studies have examined self-control when considering the relation between risk factors such as corporal punishment and later adolescent behaviors. For example, cross-sectional studies that have included middle school students (mean age of 14.5) have examined protective factors for those exposed to family violence (Kassis, Artz, Scambor, Scambor, & Moldenhauer, 2013). It was found that personal and social characteristics such as high self-concept, higher emotional self-control and being able to talk about violence helped to protect against developing aggressive behaviors in adolescence. Other longitudinal studies have examined protective factors at ages 11-12, 13-14 and 15-16 between externalizing problem behaviors at age 11-12 and rates of fighting at ages 17-18 and 19-20 (Vassallo, Edwards & Forrest, 2016). Regression analyses indicated that higher

levels of self-control at ages 11-12, 13-14 and 15-16 were associated with lower levels of fighting at age 17-18. When examining rates of fighting at age 19-20, high self-control at ages 13-14 and 15-16 were associated with lower rates of fighting. In subsequent multivariate analyses, at each timepoint, self-control was the only factor that was consistently protective against fighting at ages 19-20 when all other protective factors were considered (Vassallo, Edwards & Forrest, 2016). Self-control was also examined as a risk modifier or interactive protective factor which ameliorated the association between externalizing problems and violence (Vassallo, Edwards & Forrest, 2016). Self-control was not identified as an interactive protective factor between the risk of externalizing problems at ages 11-12 on fighting at age 17-18; however, self-control at age 15-16 and 19-20 was found to be a statistically significant interactive protective factor with regards to reduced fighting at 19-20 years (Vassallo, Edwards & Forrest, 2016).

When examining self-control as a potential interactive protective factor, is it important to consider possible gender differences. Gottfredson and Hirschi (1990) argue there are differences between male and female crime rates which are due to differences in the levels of self-control that males and females have. They argue that boys are often monitored less; therefore, girls develop higher levels of self-control. Previous research has used growth mixture modelling to test for gender differences in developmental patterns of self-control, and hierarchical linear modelling to examine gender differences in the relationships between social factors and self-control (Jo & Bouffard, 2014). The results showed that gender differences in self-control persist over the short term but not over the long term. Female levels of self-control decreased consistently over a five-year period, while for males, self-control decreased at ages 10, 11 and 12, increased between ages 12 and 13, then decreased again between ages 13 and 14. It was also found that males had significantly lower levels of self-control than females at ages 10, 11 and 12; however, the gender gap decreased and became non-significant at ages 13 and 14 (Jo & Bouffard, 2014). Their study provides partial support for Gottfredson and Hirschi's (1990) arguments on gender differences in self-control, however further investigation is required to examine the inconsistency in gender differences (Jo & Bouffard, 2014).

The effect that self-control has as an interactive protective factor on males could be different than females and this difference could be important when developing intervention or prevention programs for adolescents. For example, previous research has examined whether parenting practices are associated with later externalizing behavior problems in children (Chang, Olson, Sameroff, & Sexton, 2011). Research considered whether effortful control, which was classed as the ability to inhibit actions through elements of self-control, mediated these effects (Chang, Olson, Sameroff, & Sexton, 2011). Gender differences were found which suggested that, for boys, low levels of warm responsiveness and frequent use of corporal punishment predicted high levels of externalizing behaviors, which was mediated by deficits in effortful control. However, for girls, effortful control was not a significant mediator of the effects of parenting on disruptive behavior (Chang, Olson, Sameroff, & Sexton, 2011). This means that for boys, corporal punishment reduced levels of self-control, which resulted in higher levels of externalizing behaviors. However, for girls, self-control was not a mediator. Similar results were found in other studies (Evans, Simons & Simons, 2012). Studies that examined self-control as a mediating mechanism between corporal punishment and delinquency found that corporal punishment had an indirect effect through self-control on adolescent delinquency for males but not females (Evans, Simons & Simons, 2012). This suggests that corporal punishment reduced levels of self-control, which, in turn, resulted in increased levels

of delinquency for males but not females. The differences mentioned above with regards to the effects of corporal punishment and self-control for males and females highlights the importance of considering gender separately when investigating interactive protective factors. However, these studies did not consider a potential moderating role of self-control; a gap addressed in the current study which evaluates potential gender differences in the interactive effect of self-control.

Current Study

Adolescent research suggests that corporal punishment predicts the development of aggression (Gershoff, 2013). However, previous research rarely examines the reasons underlying the variation in the development of aggression following exposure to corporal punishment; that is, why some adolescents appear to be more resilient to its effects than others. Further, as a young person's level of aggression can fluctuate as they develop through adolescence, longitudinal studies are needed as a means to capture previous levels of aggression. Adolescence may be a particularly critical time with respect to aggression because despite a general decline in aggression, especially physical aggression, towards and during adolescence, some young people continue to show persistent aggressive behavior and may be at particular risk of becoming trapped into a pathway leading to lifelong aggression (Moffitt, 2003; Eisner & Malti, 2015). Addressing the factors that directly and interactively predict aggression at this stage of development has the potential to prevent the behavior becoming entrenched and persist into adulthood. Thus, the aim of this study is to investigate the protective capability of self-control between corporal punishment and the development of aggression from mid to late-adolescence, while accounting for previous levels of aggression. The interactive and main effect of self-control will be examined as well as developmental differences for males and females. As there is a lack in the number of empirical studies testing self-control as an interactive protective factor between corporal punishment and adolescent aggression, this study tested the hypothesis that self-control moderates the association between corporal punishment and aggression in adolescence. In line with prior research based on the differing strength of protective factors at different developmental periods, this study also hypothesized that the protective effect of self-control would differ depending on the age of the young person. Based on the above-outlined considerations, it was hypothesized that children with higher levels of self-control would be more protected against the adverse effects of corporal punishment, when considering adolescent aggression. This study also examined main effects and gender differences when considering the relation between corporal punishment, self-control, and aggression.

Methods

Participants

The analyses are based on data drawn from a combined longitudinal and intervention study, the *Zurich Project on the Social Development from Childhood to Adulthood* (z-proso). This is an experimental, prospective ongoing multi-rater longitudinal study of the development of aggressive and other antisocial behaviors that was set up in a culturally diverse urban context in Europe (e.g. Eisner, Ribeaud, Jünger & Meidert, 2008; Ribeaud & Eisner, 2010). The present analysis focused on the longitudinal component of the study. The sampling frame was formed by all 90 public primary schools in the city of Zurich in 2004 from which a random sample of 56 schools, stratified by school size and school district, was drawn (Ribeaud & Eisner, 2010). The target sample was 1675 first graders who entered one of the selected public schools in Zurich, Switzerland, at age 7 in 2004.

At baseline, (Wave 1, Age 7), the sample comprised of 1360 students. These participants were followed up at regular intervals (from parents at ages 7, 8, 9, 10; from teachers at ages 7, 8, 9, 10, 11, 13, and 15; and from children when they were aged 7, 8, 9, 10, 11, 13, 15, 17, and 20), with the most recent measurement wave completed in 2018.

At intake, the parents' educational level was as follows: 24% of parents had little or no secondary education, 32% had vocational training, 29% had a baccalaureate degree or advanced vocational diploma and 16% had a university degree. The sample was representative of the high number of immigrants living in Zurich (Ribeaud & Eisner, 2010). Specifically, the primary caregiver's country of birth was diverse, with the most common being Switzerland (43%), former Yugoslavia (14.5%), Germany (6%), and Portugal (5%).

For the current study, data from when the young people were age 11, age 13, and age 15 were used. The total number of respondents in each wave was as follows: wave 4 [N=1144, M_{age} = 11.3, 51% male (n=583), 49% female (n=561)]; wave 5 [N=1366, M_{age} = 13.7, 51% males (n=703), 49% females (n=663)]; wave 6 [N=1447, M_{age} =15.4, 52% males (n=750), 48% females (n=697). Of note, the increase in sample size across time points was due to procedural changes surrounding consent to participate as discussed below.

Procedure

Following the requirements for ethical conduct in survey-based research with human subjects in Switzerland, outlined by the Association of the Swiss Ethics Committee (2009) and later in the Swiss Human Research Act introduced in 2014, informed consent was obtained at the beginning of the study (wave one) from the parents and again from the children at age 13 onwards (Obsuth, Eisner, Malti, & Ribeaud, 2015). Of those parents who were approached, 81% (n=1,361) gave consent for their child to participate at wave one (Age 7) (valid until wave three) and 74% (n=1240) participated in the parent interview at wave one (Age 7) (Obsuth, Eisner, Malti, & Ribeaud, 2015 and Eisner, Murray, Eisner & Ribeaud, 2019). Consent was provided again by parents at wave four (age 11). In wave five and six (ages 13, and 15 respectively), parents were given the opportunity to refuse their child's participation in the study (passive consent) (Ribeaud & Eisner, 2010). In wave 5 (age 13), the entire initial target sample defined at baseline could be re-contacted which resulted in a slight increase in the number of participants in later data collection waves.

All measures were administered in German, which is the official language of Zurich. Participants were given paper-and-pencil questionnaires to complete in classrooms, which took place in 90-minute sessions. Groups typically consisted of 5 to 15 participants at a time. All data used in the current study is self-reported by participating students who were guided through the questionnaire by two or three trained staff members. At age 11, data was collected during school lessons; however, at age 13, data was collected during leisure time. Because of this, participants at age 13 were given a cash incentive worth US$30 to participate, and at age 15 they received US$50.

Measures

The measures used to assess self-control as a protective factor are explained below. Methodologically, to facilitate the analyses required to explore protective factors, data needed to be available for all three waves included in the analyses. Data from ages 11, 13 and 15 included identical measures and variables, which made

these waves of data appropriate candidates for this study. A comprehensive description of the study in terms of recruitment, attrition, measures and sample characteristics can be found in prior publications (e.g. Eisner & Ribeaud, 2007; Ribeaud & Eisner, 2010; Eisner et al., 2019) and on the study website: http://www.jacobscenter.uzh.ch/de/research/zproso.

Gender and Socioeconomic Status

Gender was recorded during the initial interviews with males coded as 1 and females coded as 2. Parent's professions were coded according to Elias and Birch (1994) and transformed into International Socioeconomic Index (ISEI) of occupational status scores ranging from 16 to 90 (Ganzeboom, Graaf, & Treiman, 1992). Final ISEI scores (based on the parent with the highest score) were standardized for further analysis.

Corporal Punishment

Data on young people's experience of corporal punishment was based on self-reported measures. The corporal punishment scales for each wave were based on the Alabama Parenting Questionnaire (Shelton, Frick, & Wootton, 1996) and the Parenting Scale from the Kriminologisches Forschungsinstitut Niedersachsen (KFN), adapted by the z-proso Project Team (Wetzels, 2001). Participants were asked to respond to three types of corporal punishment (spanking, slapping, pulling hair/ears) administered by their parents in the 12 months prior, on a 3-item scale from Never too Often (Cronbach's $\alpha_{age\ 11} = .63$; $\alpha_{age\ 13} = .70$; $\alpha_{age\ 15} = .66$). A mean score of their responses was utilized to create the scale for the current analyses.

Self-Reported Aggression

Throughout the z-proso study, aggression was measured using the Social Behavior Questionnaire (SBQ, Tremblay et al., 1991) adapted for adolescents (Murray, Eisner & Ribeaud, 2017). From age 11, children completed a paper-and-pencil questionnaire. One of the reasons for the reliance on self-reported measures of aggression stems from the fact that as they get older, adolescents have less contact time with their parents due to the increased time spent with their peers and out of the home (Marcus, 2017). This results in parents seeing less of the young person's behavior with each year of adolescence. The aggressive behavioral outcome measurement is a mean scale across 9 items on aggressive behavior. Three items each assess reactive, proactive and physical aggression in the last 12 months on a 5-point Likert scale from *never* to *very often*. A mean-score scale was derived for the present research, with higher scores indicating greater aggressive behavior (Cronbach's $\alpha_{age\ 11} = .77$; $\alpha_{age\ 13} = .84$; $\alpha_{age\ 15} = .83$). The adapted SBQ aggression measures used in this study have shown satisfactory internal consistency and concurrent and factorial validity, as well as metric invariance across adolescence, sensitivity to intervention, and resistance to response shifts (Murray, Eisner, Obsuth, et al., 2017; Murray, Eisner, & Ribeaud, 2017; Murray et al., 2018, 2019; Murray, Obsuth, Eisner, et al., 2016, 2019; Murray, Obsuth, Zirk-Sadowski, et al., 2016). This adds to the favorable psychometric evidence accumulated across other studies using the measure internationally (Lösel et al., 2013; Rouquette et al., 2012; Tremblay et al., 1991).

Self-control

Self-reported measures of self-control were used in this study. Self-control was measured using a scale derived from an adaptation of Grasmick, Tittle, Bursik, and Arneklev's (1993) low self-control scale (later modified by

Longshore, Turner, & Stein, 1996). The scale was originally developed based on the six inter-related components included in Gottfredson and Hirschi's (1990) self-control theory: impulsivity, self-centeredness, risk-seeking, volatile temper, preference for simple tasks, and preference for physical over cognitive or verbal activities. The measure is considered a gold standard measure of self-control in Criminology and is, accordingly, also the most widely used in the field (Ribeaud & Eisner, 2006). Use of this measure thus helps provide comparability with other criminological studies. For the present study, the self-control measure was created based on a 10-item mean scale using five of the 6 sub-dimensions (excluding preference for simple tasks items) of Gottfredson and Hirschi's (1990) theory, asking participants to respond using the 4-point scale from fully untrue, to fully true (higher scores reflect *lower* levels of self-control) (see Ribeaud & Eisner, 2006). The decision to exclude the sub-dimension preference for simple tasks was based on previous research which concluded that the simple tasks sub-dimension did not add explanatory power to the measure (Ribeaud & Eisner, 2006). Previous research has supported the reliability and validity of the measure in the current sample, including its scalar invariance over development (Murray, et al., 2016). A mean score of self-control responses was utilized for the current analyses (Cronbach's $\alpha_{age\ 11} = .75$, $\alpha_{age\ 13} = .78$, $\alpha_{age15} = .75$). It is important to note that the low self-control scale that was used in the current study was developed to capture the low self-control pole of self-control. Its items thus refer to behaviors reflecting a lack of self-control. Therefore, its scores are referred to in terms of higher versus lower levels of low self-control for consistency with the measure's design and label. Specific items included in the self-control measure are provided in Table 1.

[Insert Table 1 here]

Analytical Procedure

Self-control was tested as a factor moderating the links between corporal punishment and both concurrent and subsequent aggression using autoregressive cross-lagged panel models estimated in Mplus 8 (Muthen & Muthen, 1998 – 2017). Modelling autoregressions within the cross-lagged panel analysis allows the model to control for past levels of aggression, experiences of corporal punishment and self-control. Adding product terms formed of centered predictors allows moderating effects to be tested, just as in standard regression models. This method was used to test the hypothesis that low self-control exacerbates the effect of corporal punishment on aggression. Due to the symmetry of interactions, this is equivalent to testing the protective effect of higher levels of self-control. However, as Grasmick's low self-control scale was developed to measure low self-control and all items refer to behaviors indicative of a lack of self-control, the original scoring method was retained such that high scores represent lower levels of self-control while lower scores represent higher levels of self-control. Descriptive statistics and correlations were all run using IBM SPSS version 24.

To account for data missingness and skewness, maximum likelihood estimation with robust standard errors (MLR) for parameter estimation was used. Model fit was evaluated using the comparative fit index (CFI), the Tucker-Lewis index (TLI) and the root mean square error of approximation (RMSEA). Good fit was judged as CFI values >.95 and TLI values >.95 and for RMSEA values <.05 (Hu & Bentler, 1999). The chi-square is also reported for all models but was not used in the evaluation of model fit due to the tendency of the chi-square to over-reject trivially mis-specified models for large samples (Hu & Bentler, 1999). Standardized regressions, coefficients or betas are presented throughout. These may be interpreted as indicators of relative effect size.

Finally, the above was split by gender to ascertain if the moderating effect of self-control on the evolution of aggression differed for boys and girls as they develop from mid to late-adolescence. Structural equation modelling is a confirmatory modelling approach that assesses the consistency of data with pre-specified hypotheses; however, it can be used in an exploratory fashion in the context of model generation (Jöreskog, 1993). In the current study, the possibility of introducing model modifications was allowed if initial hypotheses were not supported. In this respect, the analyses should be considered exploratory.

Results

Descriptive Analyses

Mean levels of corporal punishment, low self-control and aggression across the three timepoints are displayed in Table 2.

[Insert Table 2 here]

Correlations

Correlations among the corporal punishment, self-control, and aggression variables are displayed in Table 3. All correlations were positive and statistically significant.

[Insert Table 3 here]

Autoregressive Cross-Lagged Panel Model Results: Self-Control

To test self-control as an interactive protective factor, the autoregressive cross-lagged panel model presented in Figure 1 was fit. The initial autoregressive cross-lagged panel model that was fit for the whole sample (i.e., not accounting for gender) did not result in a good fit to the data, $X^2(36) = 239.13$, p<.05, RMSEA = .07, 90% CI [0.02, 0.04], CFI = .88, TLI = .78. A covariance between two of the product terms (age 11 corporal punishment by age 13 self-control and age 11 corporal punishment and age 11 self-control) was added based on modification indices and expected parameter changes. The addition of this path resulted in a good fit to the data, $X^2(31) = 67.69$, p<.05, RMSEA = .03, 90% CI [0.02, 0.04], CFI = .98 TLI = .97.

[Insert Figure 1 around here]

Results of this model are displayed in Figure 2 with only statistically significant paths relevant to moderation results displayed (non-significant results not displayed are available upon request from the first author). Fully standardized parameter estimates indicated that inter-individual differences in corporal punishment ($\beta_{Age11\text{-}13}$ = .33, p<.05 and $\beta_{Age13\text{-}15}$ = .31, p<.05), self-control ($\beta_{Age11\text{-}13}$ = .45, p<.05 and $\beta_{Age13\text{-}15}$ = .44, p<.05) and aggression ($\beta_{Age11\text{-}13}$ = .32, p<.05 and $\beta_{Age13\text{-}15}$ = .39, p<.05) were stable over time. Main effects of self-control on aggression are provided in Table 4. Results show that across all age groups within the full sample, self-control had a significant main effect with concurrent levels of aggression, with those showing the fewest problems with low self-control also showing the least aggression. Results also indicated that self-control at age 11 was a significant

interactive protective factor between age 11 corporal punishment and age 11 aggression (β = .08, p<.05); however, self-control did not show a significant moderating effect at any other age.

[Insert Figure 2 here]

[Insert Table 4 here]

Gender Differences

To evaluate gender differences in the longitudinal relations between corporal punishment, self-control, and aggression, a separate multi-group model was fit. The main autoregressive cross-lagged panel model (Figure 1) with paths free to vary across males and females provided a poor fit to the data (X^2(72) = 312.46 p<.05, CFI = .85, TLI = .73, RMSEA = .08). Modification indices were examined, and the largest recommended correlational path was added to the model (age 11 corporal punishment x age 13 self-control product term correlated with age 11 corporal punishment x age 11 self-control product term). Once this was added, the model provided a good fit to the data (X^2(62) = 121.02 p<.05, CFI = .97, TLI = .94, RMSEA = .04). The results for the autoregressive cross-lagged analysis for males is displayed in Figure 3 and Figure 4 for females, with paths only relevant to interactive protective factors displayed (full results are available upon request from the first author).

Males. When examining the main effects between self-control and aggression for males (Table 5) results show that self-control acted as a direct protective factor against concurrent aggression, with those with the least issues with low self-control also showing the least aggression. There was also a significant interactive effect between age 11 self-control and age 11 corporal punishment in predicting age 11 aggression (β = .10, p<.05), with low self-control exacerbating the negative effects of corporal punishment; however, the only other moderating effect identified for males was in the opposite direction (β = -.10, p<.05). There was again no consistent moderating effect of self-control on the relation between corporal punishment and aggression.

[Insert Figure 3 here]

[Insert Table 5 here]

Females. Consistent with the results for males, main effects of self-control on concurrent aggression were significant, with those with the least problems with low self-control also showing the least aggression. There was only one significant interaction, with age 13 self-control significantly moderating the relation between age 11 corporal punishment and age 15 aggression (β = -.09, p<.05). Thus, as in males, there was no consistent moderating effect of self-control.

[Insert Figure 4 here]

[Insert Table 6 here]

Sensitivity Analyses

To ensure the robustness of results, sensitivity tests were conducted. These included repeating analyses using self-reported aggression, teacher reported aggression and a combined child-teacher reported aggression measure. Results indicated that there was no substantive difference in the pattern of results based on informants of aggression. Thus, the self-reported measure was used so as to keep all measures from the same source of information. Further information about sensitivity analyses are available upon request from the first author.

Discussion

Prior research has identified that those who experience corporal punishment tend to develop increased aggression in later adolescence; however, very little is known about the factors that ameliorate the effects of corporal punishment or protect those who experience corporal punishment from developing subsequent aggression during adolescence. Based on data collected using a European sample between the ages of 11 and 15, this study examined the protective effect of self-control between parental use of corporal punishment and the impact on adolescent aggression. This was achieved using an autoregressive cross-lagged panel model which allowed analyses to account for previous levels of aggression, as well as examine how the relations between self-control, corporal punishment and aggression evolve over development. Results suggested that while self-control had a significant main effect on aggression, it was a moderator of the relation between corporal punishment and aggression for only a small subset of the relevant paths tested, with the direction of the effect being inconsistent.

When considering adolescent aggression at age 11, age 13 and age 15, self-control was found to be a direct protective factor, with least issues of low self-control associated with lower levels of concurrent aggression across all ages while accounting for previous levels of aggression. This was also the case when examining main effects split by gender. These main effects are important to consider when discussing intervention strategies as it demonstrates that, irrespective of a child's experience with corporal punishment, developing high levels of self-control is worth promoting when trying to reduce levels of adolescent aggression.

Previous research has found that the strength of a direct protective factor can differ depending on the stage of development of the adolescent (e.g. Dubow et al., 2016; Kim et al., 2016). This was evident within the current study as differences regarding the protective strength of self-control were found between mid to late-adolescence. Results show that self-control had the strongest main effect with aggression at age 11, with the weakest main effect at age 15. This was also the case for males when gender differences were examined. However, for females, self-control had the strongest main effect with reduced aggression at age 13 and the weakest main effect was at age 15. In addition to there being gender differences with regards to the strength of main effects during mid and late-adolescence, there were also differences between males and females within the same timepoint. For example, self-control had a stronger main effect for females at ages 13 and 15 when compared to males; however, the main effect was stronger for males at age 11. This is an important contribution of this study to adolescent research because not only does it suggest that the effect of this direct protective factor differs by developmental stage, but it also differs between males and females depending on their stage of adolescence. This is a significant point to keep in mind when considering future intervention programs, which may be most cost-effective when targeted at the those at highest risk and across the developmental stages when the association between risk factor and outcome are strongest. However, despite its main effects on aggression

and a few isolated significant effects in inconsistent directions, the overall pattern of these results suggested no consistent moderating effect of self-control on aggression. Thus, interventions targeting self-control (i.e., Denson et al., 2011) are most likely to reduce aggression via direct effects on aggression, rather than by weakening the links between experiences of harsh punishment and aggression.

First, it is important to consider some of the limitations of the current study. Capturing the extent of corporal punishment is often difficult due to it going either unreported or unrecognized by both parents and children (Fréchette, Zoratti, & Romano, 2015; Straus & Stewart, 1999; Straus, 2010). Furthermore, children who experience corporal punishment by a family member may not disclose their experiences to others because they do not want to appear to be a troublemaker or a liar (Krahé, 2001). Self-reported experiences of corporal punishment could be influenced by limits of recall accuracy as well as the fact that it is a controversial form of discipline which is sometimes believed to be an appropriate punishment (Fréchette et al., 2015). In Zurich, where data for the current study was collected, corporal punishment is lawful in the home under the parent's right of correction. It can be difficult to confidently differentiate between corporal punishment and physical abuse due to the potential overlap of their definitions.

With regards to the measure of self-control, this study focused on low self-control descriptors, rather than also including measures of high self-control. Therefore, it is possible that the low self-control measure does not adequately capture high levels of self-control, which may result in difficulty of identifying an interactive protective effect in which high self-control attenuates the relation between corporal punishment and aggression. In general, studies should aim to use measures that have been shown to reliably measure a wide range of trait levels, to maximize statistical power and to ensure that both ordinal and disordinal interactions can be detected (e.g., Widaman et al., 2012). This applies particularly to studies of risk or resilience where there is often a lack of clarity on whether a particular variable acts in a unipolar manner or bipolar manner; that is, whether a candidate moderator is both an indirect risk *and* protective factor (at its respective poles) or whether it is solely a risk *or* protective factor (at one pole).

There are many strengths of the current study. First, the current study includes the use of longitudinal data which allows for the consideration of temporal order of predictors and protective factors. Furthermore, the use of longitudinal data allowed the analyses to measure exposure of corporal punishment and adolescent aggression concurrently, which helps to establish causal effects. The use of the autoregressive cross-lagged panel model to test for interactions is a further strength of this study. This allowed the analyses to account for previous levels of aggression. Autoregressive cross-lagged panel models have been found to result in smaller main effects. This is because autoregressive cross-lagged panel models account for previous levels of the outcome variable (i.e. aggression) which can lead to a dramatic reduction in the association between the predictor and the outcome (Adachi & Willoughby, 2015). The disadvantage is that by controlling for stability effects, a large portion of the variance in the outcome variable is removed. However, studies have found that although smaller main effects might be found using this statistical approach, those results are still meaningful and worth further interpretation (Adachi & Willoughby, 2015). The strength of the autoregressive cross-lagged panel model is that it allows the user to ensure that any cross-lagged effects did not simply reflect the association between those two variables at the previous time point.

Conclusion

Both corporal punishment and low self-control were found to be risk factors for aggression, with both having unique effects over and above the effects of the other. Results from the current study support the view that the relations between corporal punishment, self-control and aggression remains important throughout adolescence. This was indicated by the fact that associations remain significant across the entire span included in the current study, with concurrent and recent levels of corporal punishment and self-control significant predictors of aggression irrespective of developmental stage. This underlines the importance of these risk factors as intervention targets to reduce aggression. However, the effects of these risk factors were purely additive, with no consistent evidence that self-control moderated the association between corporal punishment and aggression. This suggests that self-control interventions are most likely to work due to a direct effect on aggression and are not likely to be effective contingent on a person's exposure to corporal punishment.

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Table 1 Self-Control Scale Items

Item
Impulsivity
I often act in the moment without stopping to think.
I do whatever brings me pleasure here and now, even at the cost of some distant goal.
Self-centeredness
I try to get the things I want even when I know it's causing problems for other people.
If the things I do upset people, it's their problem, not mine.
Risk-Seeking
Sometimes I do dangerous things just for the fun of it.
Excitement and adventure are more important to me than security.
Volatile temper
If I don't get something I want immediately, I get angry pretty quickly.
I lose my temper pretty easily.
Preference for Physical activities
If I have a choice, I would rather do something physical than something mental.
I like to get out and do things more than I like to read or contemplate ideas.

Table 2 Descriptive Statistics

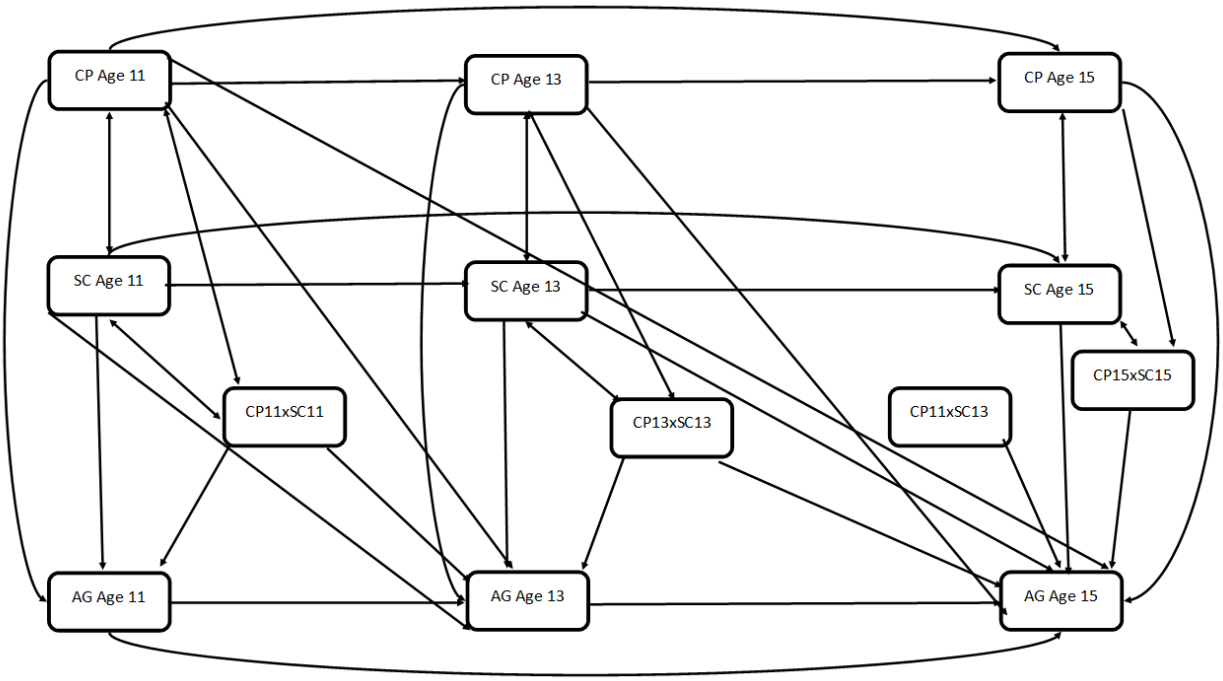
	N	*M*	*SD*	Range	Skewness	Kurtosis
Corporal Punishment						
Age 11	1144	1.22	0.41	1-4	2.80	10.51
Age 13	1350	1.20	0.42	1-4	2.94	10.40
Age 15	1445	1.17	0.37	1-4	2.80	8.68
Low Self-Control						
Age 11	1146	1.95	0.48	1-4	.44	.13
Males	583	2.02				
Females	563	1.87				
Age 13	1358	2.21	0.48	1-4	.20	.19
Males	701	2.26				
Females	657	2.13				
Age 15	1444	2.27	0.43	1-4	.25	.51
Males	748	2.32				
Females	696	2.23				
Aggression						
Age 11	1144	1.54	0.44	1-4	1.53	3.26
Males	581	1.65				
Females	563	1.43				
Age 13	1365	1.75	0.59	1-4.89	1.36	2.22
Males	703	1.90				
Females	662	1.59				
Age 15	1446	1.69	0.56	1-4.56	1.52	2.84
Males	749	1.81				
Females	697	1.56				

Table 3 Correlations between Corporal Punishment, Self-control and Aggression

	1	2	3	4	5	6	7	8	9
Corporal Punishment									
1. Age 11		.33**	.25**	.19**	.06*	.07*	.32**	.17**	.17**
2. Age 13			.41**	.06	.18**	.10**	.12**	.28**	.21**
3. Age 15				.04	.09**	.18**	.09**	.16**	.28**
Self-Control									
4. Age 11					.44**	.32**	.54**	.28**	.23**
5. Age 13						.50**	.31**	.52**	.36**
6. Age 15							.24**	.35**	.50**
Aggression									
7. Age 11								.43**	.34**
8. Age 13									.55**
9. Age 15									

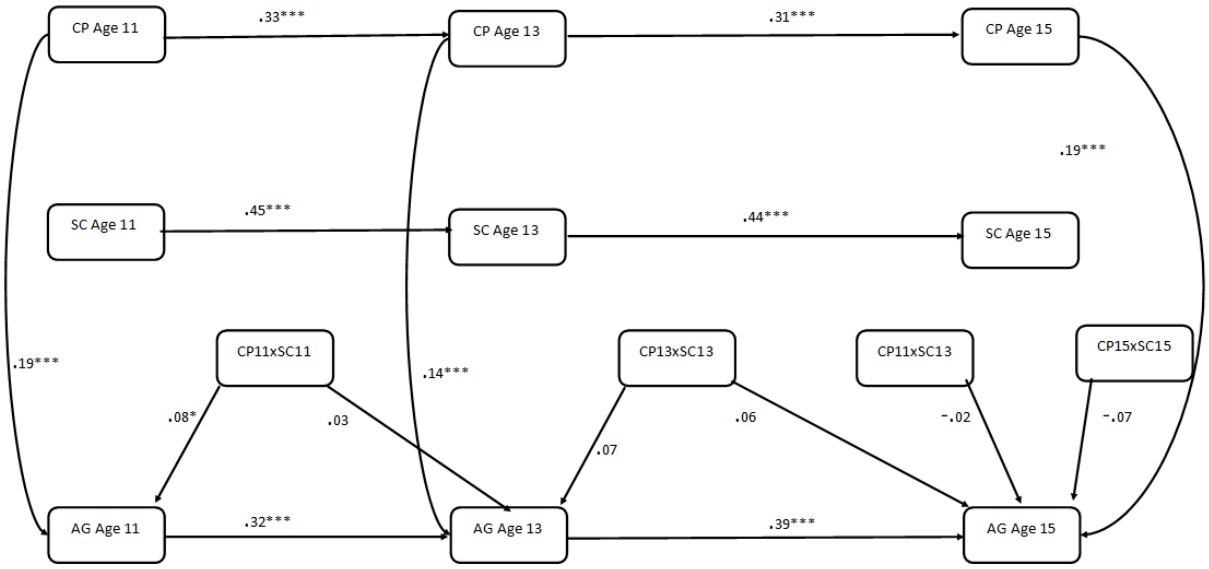
Note. *$p<.05$ ** $p<.01$.

Fig. 1 Autoregressive Cross-lagged Panel Model Testing Self-Control as a Protective Factor



Note. AG = Aggression. CP = Corporal Punishment. SC = Low Self-control.
Lines with one arrow represent regression paths. Lines with two arrows represent correlational paths.

Fig. 2 Autoregressive Cross-Lagged Panel Model Testing Self-Control as an Interactive Protective Factor between Corporal Punishment and Aggression



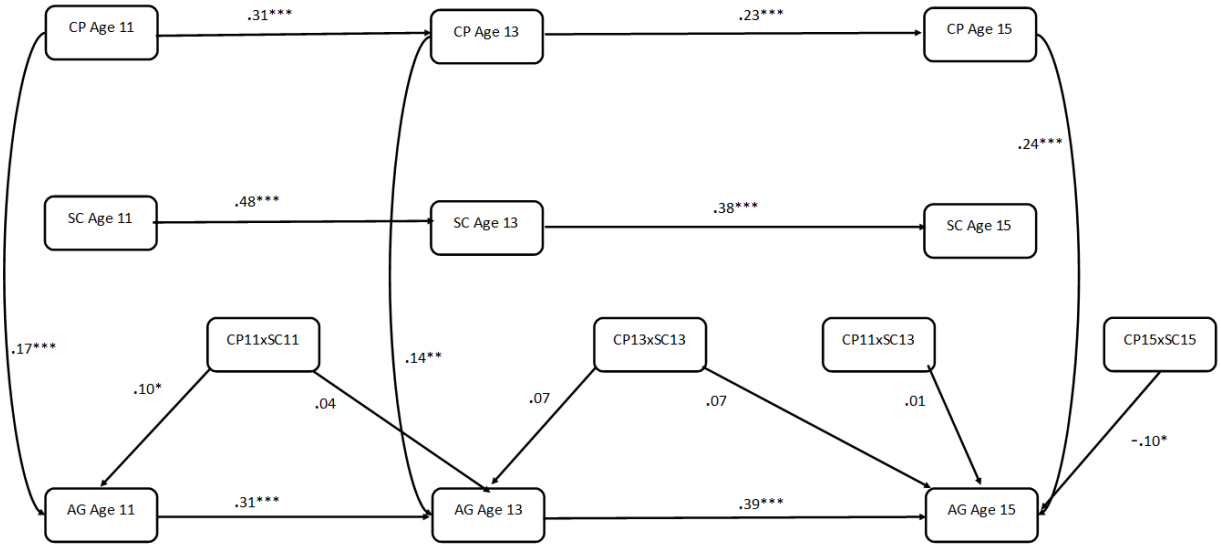
Note. *p<.05, **p<.01, ***p<.001. AG = Aggression. SC = Self-control. CP= Corporal Punishment. Lines represent regression paths.

Table 4 Path Results of Autoregressive CLPM Testing Self-Control as an Interactive Protective Factor

Regression Paths	Estimate	*S.E.*	*Est./S.E.*	*Sig.*
Outcome Variable: Age 15 Aggression				
Age 15 Self-Control (Centered)	.354	0.029	12.137	<.001
Age 15 Corporal Punishment (Centered)	.186	0.034	5.412	<.001
Age 15 Corporal Punishment x Age 15 Self-Control (Product Term)	-.073	0.037	-1.955	.051
Age 13 Corporal Punishment (Centered)	-.019	0.032	-0.584	.559
Age 13 Self-Control (Centered)	-.066	0.031	-2.137	.033
Age 13 Corporal Punishment x Age 13 Self-Control (Product Term)	.061	0.054	1.117	.264
Age 11 Corporal Punishment (Centered)	.017	0.031	0.525	.600
Age 11 Corporal Punishment x Age 13 Self-Control (Product Term)	-.022	0.033	-0.676	.499
Outcome Variable: Age 13 Aggression				
Age 13 Self-Control (Centered)	.428	.029	14.519	<.001
Age 13 Corporal Punishment (Centered)	.136	.031	4.401	<.001
Age 13 Corporal Punishment x Age 13 Self-Control (Product Term)	.067	.044	1.530	.126
Age 11 Corporal Punishment (Centered)	-.001	.033	-0.022	.982
Age 11 Self-Control (Centered)	-.070	.035	-2.039	.041
Age 11 Corporal Punishment x Age 11 Self-Control (Product Term)	.028	.033	0.846	.398
Outcome Variable: Age 11 Aggression				
Age 11 Self-Control (Centered)	.494	.026	19.316	<.001
Age 11 Corporal Punishment (Centered)	.192	.032	6.017	<.001
Age 11 Corporal Punishment x Age 11 Self-Control (Product Term)	.082	.034	2.397	.017

Note. Est= parameter estimate; S.E.= standard error.

Fig. 3 CLPM for Males when Testing Self-Control as an Interactive Protective Factor



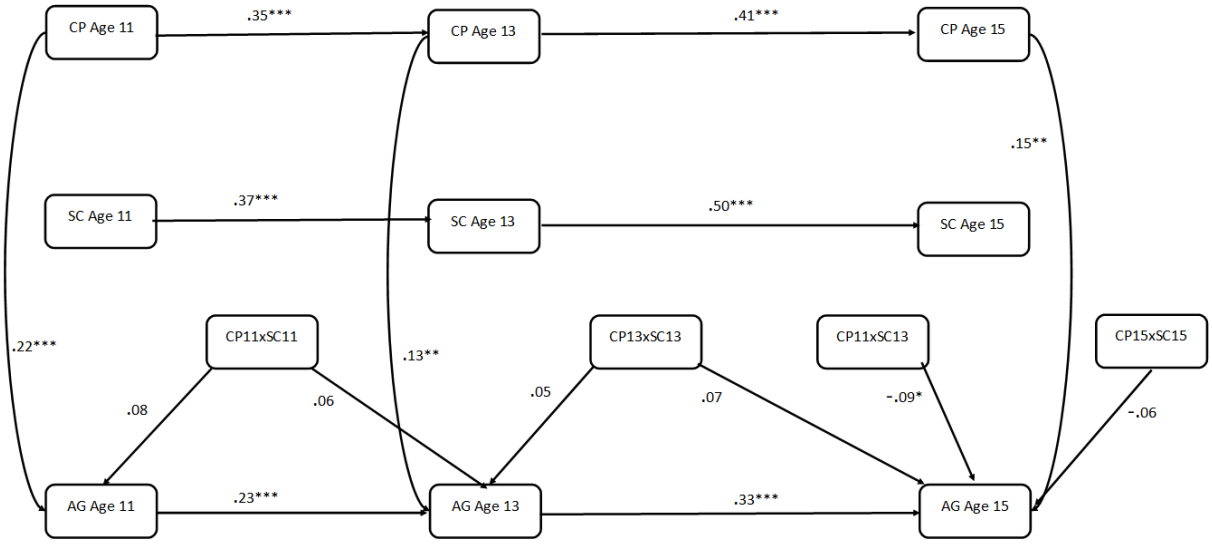
Note. *p<.05, **p<.01, ***p<.001. AG = Aggression. SC = Self-control. CP= Corporal Punishment. Lines represent regression paths.

Table 5 Path Results for Males of Autoregressive CLPM Testing Self-Control as an Interactive Protective Factor

Regression Paths	Estimate	*S.E.*	*Est./S.E.*	*Sig.*
Outcome Variable: Age 15 Aggression				
Age 15 Self-Control (Centered)	.326	.039	8.391	<.001
Age 15 Corporal Punishment (Centered)	.239	.043	5.595	<.001
Age 15 Corporal Punishment x Age 15 Self-Control (Product Term)	-.095	.047	-2.048	.041
Age 13 Corporal Punishment (Centered)	-.049	.042	-1.161	.245
Age 13 Self-Control (Centered)	-.032	.041	-0.795	.427
Age 13 Corporal Punishment x Age 13 Self-Control (Product Term)	.066	.072	0.922	.356
Age 11 Corporal Punishment (Centered)	.081	.043	1.883	.060
Age 11 Corporal Punishment x Age 13 Self-Control (Product Term)	.003	.049	0.056	.956
Outcome Variable: Age 13 Aggression				
Age 13 Self-Control (Centered)	.397	.043	9.221	<.001
Age 13 Corporal Punishment (Centered)	.138	.040	3.426	.001
Age 13 Corporal Punishment x Age 13 Self-Control (Product Term)	.074	.058	1.271	.204
Age 11 Corporal Punishment (Centered)	-.026	.043	-.597	.550
Age 11 Self-Control (Centered)	-.053	.049	1.070	.285
Age 11 Corporal Punishment x Age 11 Self-Control (Product Term)	.038	.039	.961	.337
Outcome Variable: Age 11 Aggression				
Age 11 Self-Control (Centered)	.505	.033	15.468	<.001
Age 11 Corporal Punishment (Centered)	.172	.043	3.974	<.001
Age 11 Corporal Punishment x Age 11 Self-Control (Product Term)	.100	.044	2.242	.025

Note. Est= parameter estimate; S.E.= standard error.

Fig. 4 Autoregressive CLPM for Females when Testing Self-Control as an Interactive Protective Factor



Note. *p<.05, **p<.01, ***p<.001. AG = Aggression. SC = Self-control. CP= Corporal Punishment. Lines represent regression paths.

Table 6 Path Results for Females of Autoregressive CLPM Testing Self-Control as an Interactive Protective Factor

Regression Paths	Estimate	*S.E.*	*Est./S.E.*	*Sig.*
Outcome Variable: Age 15 Aggression				
Age 15 Self-Control (Centered)	.424	.042	10.053	<.001
Age 15 Corporal Punishment (Centered)	.152	.051	2.973	.003
Age 15 Corporal Punishment X Age 15 Self-Control (Product Term)	-.058	.064	-0.914	.361
Age 13 Corporal Punishment (Centered)	.044	.046	0.967	.334
Age 13 Self-Control (Centered)	-.113	.046	-2.461	.014
Age 13 Corporal Punishment X Age 13 Self-Control (Product Term)	.070	.052	1.329	.184
Age 11 Corporal Punishment (Centered)	-.080	.044	-1.806	.071
Age 11 Corporal Punishment X Age 13 Self-Control (Product Term)	-.091	.042	-2.176	.030
Outcome Variable: Age 13 Aggression				
Age 13 Self-Control (Centered)	.489	.038	12.803	<.001
Age 13 Corporal Punishment (Centered)	.126	.048	2.652	.008
Age 13 Corporal Punishment X Age 13 Self-Control (Product Term)	.052	.044	1.183	.237
Age 11 Corporal Punishment (Centered)	.045	.049	0.917	.359
Age 11 Self-Control (Centered)	-.117	.050	-2.347	.019
Age 11 Corporal Punishment X Age 11 Self-Control (Product Term)	.061	.076	0.801	.423
Outcome Variable: Age 11 Aggression				
Age 11 Self-Control (Centered)	.430	.045	9.620	<.001
Age 11 Corporal Punishment (Centered)	.224	.050	4.487	<.001
Age 11 Corporal Punishment X Age 11 Self-Control (Product Term)	.075	.043	1.749	.080

Note. Est= parameter estimate; S.E.= standard error.